

**Technical training.**  
**Product information.**

## **F30 Passive Safety Systems**



**BMW Service**

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**Technical Training**

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## General information

### Symbols used

The following symbol is used in this document to facilitate better comprehension or to draw attention to very important information:



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Contains important safety information and information that needs to be observed strictly in order to guarantee the smooth operation of the system.

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### Information status and national-market versions

BMW Group vehicles meet the requirements of the highest safety and quality standards. Changes in requirements for environmental protection, customer benefits and design render necessary continuous development of systems and components. Consequently, there may be discrepancies between the contents of this document and the vehicles available in the training course.

This document basically relates to the European version of left-hand drive vehicles. Some operating elements or components are arranged differently in right-hand drive vehicles than shown in the graphics in this document. Further differences may arise as a result of the equipment specification in specific markets or countries.

### Additional sources of information

Further information on the individual topics can be found in the following:

- Owner's Handbook
- Integrated Service Technical Application.

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The information contained in this document forms an integral part of the technical training of the BMW Group and is intended for the trainer and participants in the seminar. Refer to the latest relevant information systems of the BMW Group for any changes/additions to the technical data.

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# F30 Passive Safety Systems

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# F30 Passive Safety Systems

## 1. Introduction

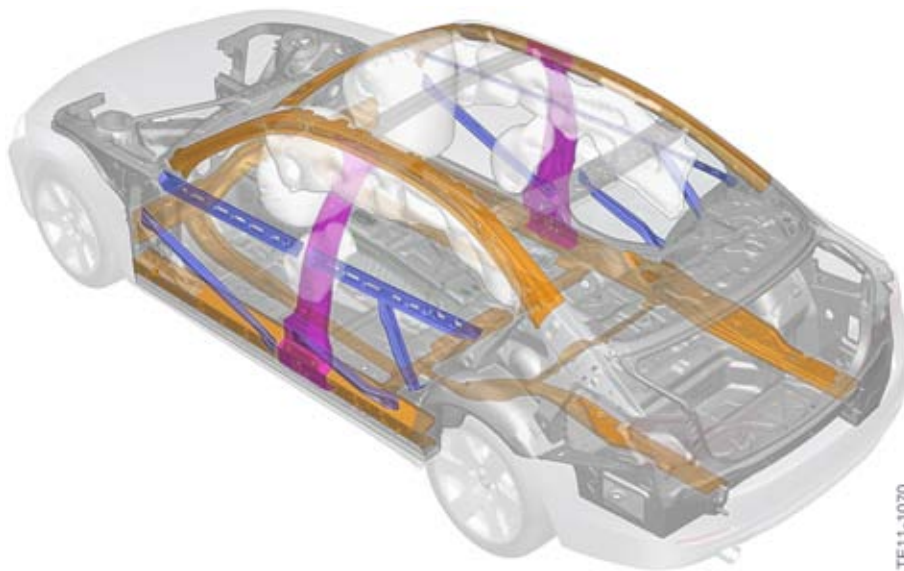
### 1.1. The hidden protector

The passive safety system of the F30 is based on the objectives and characteristics of current BMW models. The passive safety system fulfils all legislative requirements worldwide.

For this, extensive measures were performed on the body and on the occupants' safety and protection systems. In addition to the restraint system, a special body structure with a defined crash behavior is also part of the passive safety system. In the event of an accident, the forces introduced are reduced in a defined manner and therefore have less of an impact on the occupants.

The restraint systems ensure that the risk of injury is further reduced.

The 4th generation Advanced Crash Safety Module ACSM is used as the central airbag control unit for the passive safety system in the F30. The central sensor system is incorporated in the ICM.



F30 Passive safety system

# F30 Passive Safety Systems

## 2. Models

### 2.1. Overview

In the 4th generation, the passive safety system is installed as a Crash Safety Module in the F30. The following table provides an overview of the versions installed for different models:

<b>Series</b>	<b>Model</b>	<b>Used as of</b>	<b>Version</b>
E60	5-Series Sedan	09/2005	ACSM 1
E61	5-Series Touring	09/2005	ACSM 1
E85	Z4 Roadster	01/2006	ACSM 1
E86	Z4 Coupé	05/2006	ACSM 1
E87	1-Series 5-door	04/2004	MRS 5
E88	1-Series Convertible	04/2008	ACSM 2
E90	3-Series Sedan	03/2005	MRS 5
E70	X5 SAV	11/2006	ACSM 2
E71	X6 SAC	04/2008	ACSM 2
E93	3-Series Convertible	03/2007	ACSM 2
F01	7-Series Sedan	11/2008	ACSM 3
F02	7-Series Sedan long version	11/2008	ACSM 3
F07	5-Series Gran Turismo	10/2009	ACSM 3
F10	5-Series Sedan	03/2010	ACSM 3
F25	X3 SAV	11/2010	ACSM 4
F12	6-Series Convertible	03/2011	ACSM 4
F20	1-Series 5-door	09/2011	ACSM 4
F30	3-Series Sedan	02/2012	ACSM 4

# F30 Passive Safety Systems

## 3. System Overview

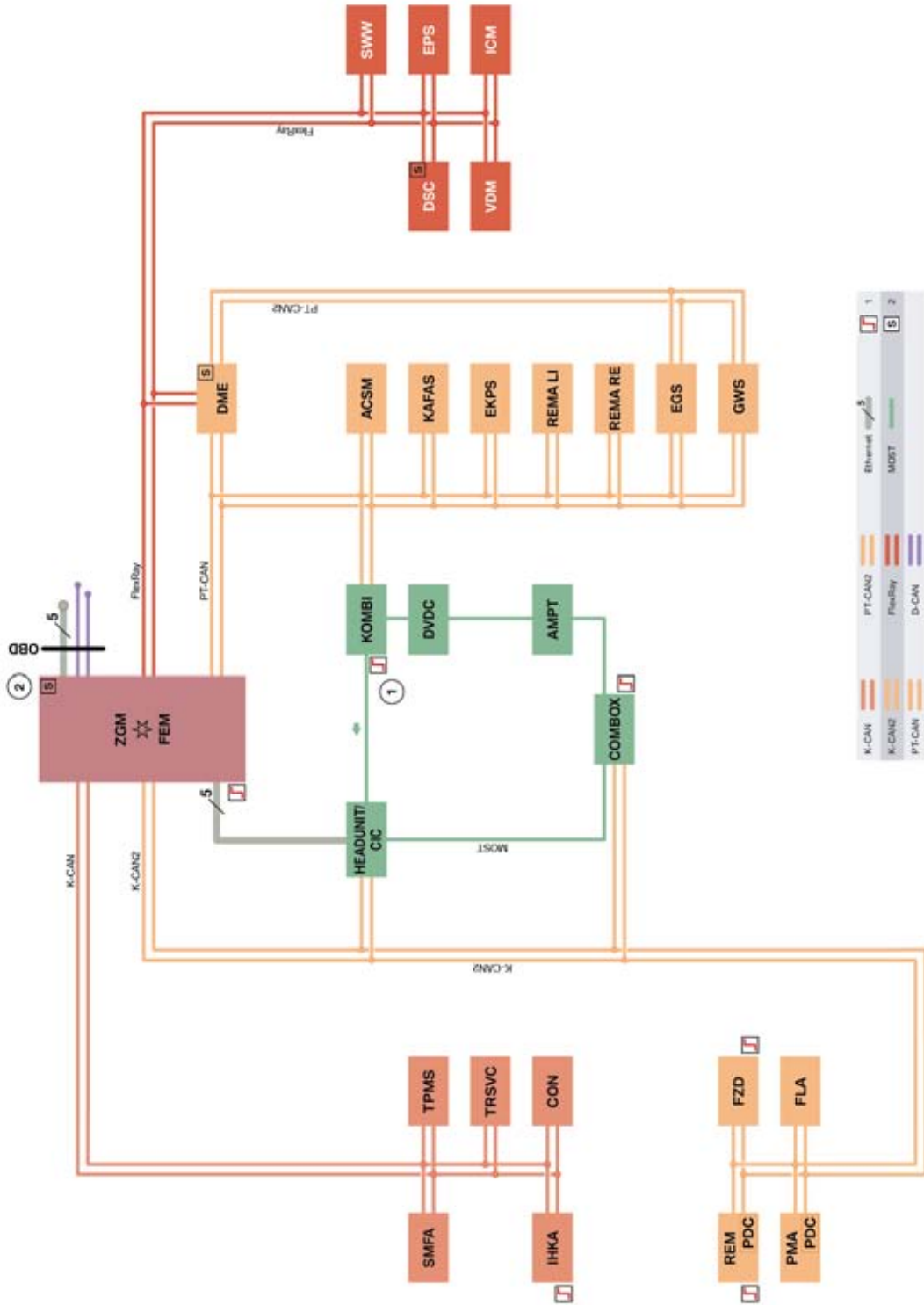
### 3.1. System wiring diagrams

The following bus overview shows the vehicle circuit structure of the F30 and incorporation of the modules on the PT-CAN.

# F30 Passive Safety Systems

## 3. System Overview

### 3.1.1. Bus overview



F30 Bus overview



# F30 Passive Safety Systems

## 3. System Overview

Index	Explanation
1	Control units with wake-up authorization
2	Start-up node control units for starting and synchronizing the FlexRay bus system
ACSM	Advanced Crash Safety Module
AMPT	Top-HiFi amplifier
COMBOX	Combox (Combox emergency call, Multimedia Combox)
CON	Controller
D-CAN	Diagnosis-on-Controller Area Network
DME	Digital Engine Electronics (DME)
DSC	Dynamic Stability Control
DVDC	DVD changer
EGS	Electronic transmission control
EKPS	Electronic fuel pump control
EPS	Electromechanical Power Steering
Ethernet	Cable-based data network technology for local data networks
FEM	Front Electronic Module
FLA	High-beam assistant
FlexRay	Fast, preset and fault-tolerant bus system for use in automotive sector
FZD	Roof function center
GWS	Gear selector lever
HEADUNIT/CIC	Headunit (Car Information Computer or Basic headunit)
ICM	Integrated Chassis Management
IHKA	Integrated automatic heating / air conditioning
K-CAN	Body controller area network
K-CAN2	Body controller area network 2
KAFAS	Camera-based driver assistance systems
KOMBI	Instrument cluster (MOST only with option 6WA)
MOST	Media Oriented System Transport
OBD	On-board diagnosis (diagnostic socket)
PDC	Park Distance Control (with option 5DP, parking manoeuvring assistant: integrated in the parking manoeuvring assistant control unit, otherwise integrated in the Rear Electronic Module control unit)
PMA	Parking manoeuvring assistant
PT-CAN	Powertrain controller area network
PT-CAN2	Powertrain controller area network 2
RAD	Radio

# F30 Passive Safety Systems

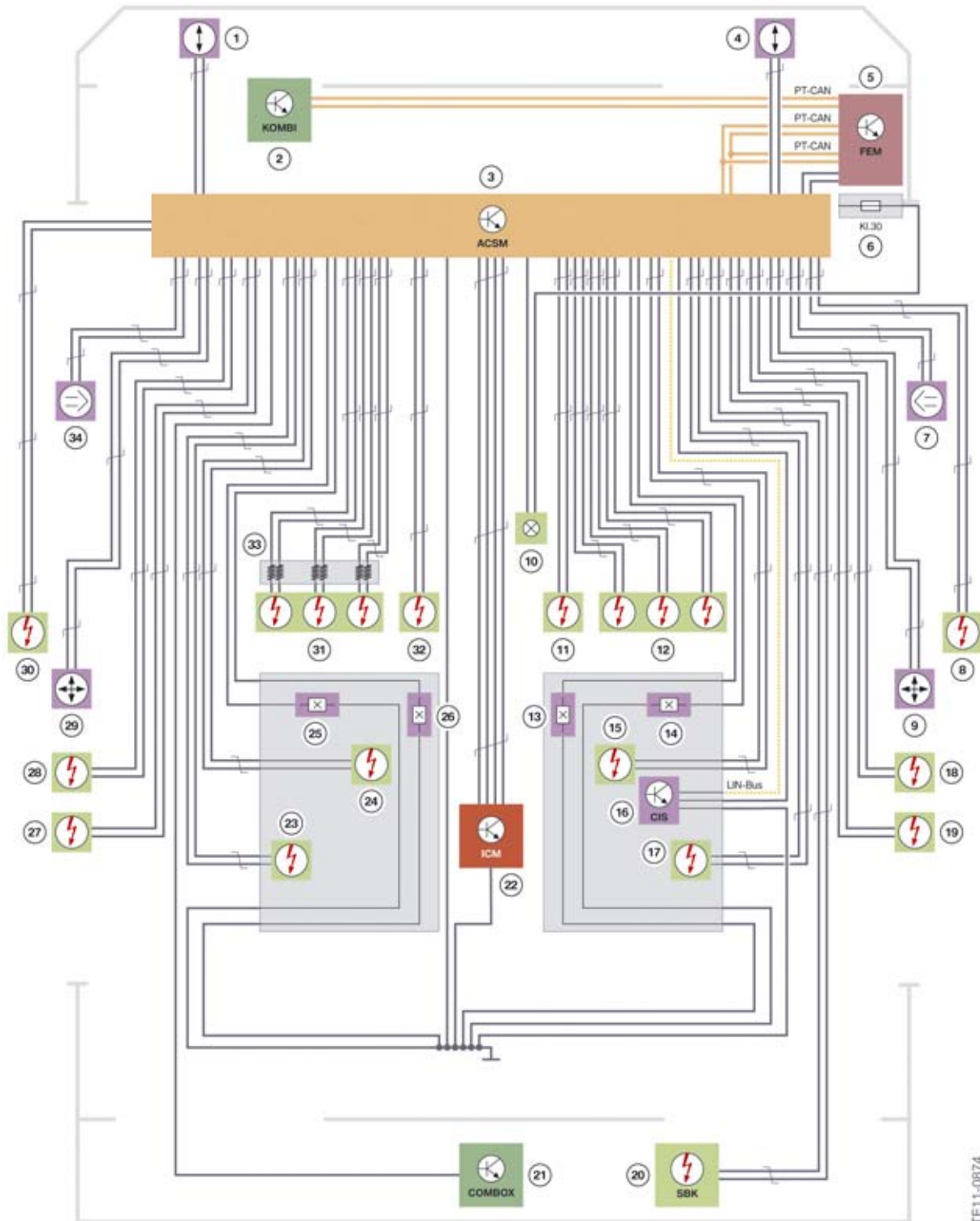
## 3. System Overview

<b>Index</b>	<b>Explanation</b>
REM	Rear Electronic Module
REMA LI	Reversible electromotive automatic reel, left (not US)
REMA RE	Reversible electromotive automatic reel, right (not US)
SMFA	Seat module, driver
SWW	Lane change warning
TPMS	Tire Pressure Monitoring System
TRSVC	Control unit for all-round vision camera
VDM	Vertical Dynamics Management
ZGM	Central gateway module

# F30 Passive Safety Systems

## 3. System Overview

### 3.1.2. System wiring diagram



F30 System wiring diagram

TE11-0874

# F30 Passive Safety Systems

## 3. System Overview

Index	Explanation
1	Front sensor, left engine support
2	Instrument cluster
3	Crash Safety Module
4	Front sensor, right engine support
5	Front Electronic Module (FEM)
6	Terminal 30
7	Airbag sensor, door, right (pressure)
8	Head airbag, front passenger
9	Acceleration sensor, B-pillar on right
10	Indicator lamp for front passenger airbag deactivation in roof function center
11	Knee airbag, front passenger
12	Front passenger airbag, two-stage with ventilation
13	Seat belt buckle contact, front passenger
14	Seat-position sensor, front passenger
15	Seat belt buckle tensioner, front passenger
16	Seat occupancy mat, CIS mat
17	Side airbag, front passenger
18	Automatic tensioner, front passenger
19	Adaptive belt force limiter, front passenger (not US)
20	Safety battery terminal
21	COMBOX
22	Integrated Chassis Management
23	Side airbag, driver's side
24	Seat belt buckle tensioner, driver
25	Seat-position sensor, driver (not US)
26	Seat belt buckle contact, driver
27	Adaptive belt force limiter, driver (not US)
28	Automatic tensioner, driver
29	Acceleration sensor, B-pillar on left
30	Head airbag, driver
31	Driver's airbag, two-stage with ventilation
32	Knee airbag, driver
33	Clock spring
34	Airbag sensor, door, left (pressure)

# F30 Passive Safety Systems

## 4. Functions

### 4.1. Functions of Crash Safety Module

The function of the Crash Safety Module is to permanently evaluate all sensor signals in order to identify a crash situation. As a result of the sensor signals and their evaluation, the Crash Safety Module identifies the direction of the crash and the severity of the impact.

The ACSM evaluates the information from the sensors and then forwards corresponding measures for selective activation of the necessary restraint systems.

The Crash Safety Module monitors the system itself and indicates when it is ready for operation by switching off the airbag indicator light.

If an error occurs during operation this is stored in a fault memory, and can be read out for diagnosis purposes.

If a crash situation is detected, a crash message is sent to the other bus users in the data bus network as notification. The relevant control units respond to this signal by executing their own activities according to the severity of the crash.

The activities include:

- Opening the central locking system
- Activating the hazard warning flasher
- Switching on the interior light
- Deactivating the electric fuel pump
- Making an emergency call.

An additional function of the Crash Safety Module is the acoustic seat belt warning that reminds the driver and front passenger using visual and acoustic signals to fasten their seat belts. Seat belt buckle switches are used to identify whether the driver and/or the front passenger have their seat belts fastened. Information on occupancy of the front passenger seat is also included for the acoustic seat belt warning. Furthermore the position of the driver and the front passenger seat is monitored.

The functions of the Crash Safety Module generally belong to one of the following areas:

- Crash-relevant functions
- System-monitoring functions
- Additional convenience functions.

### 4.2. Crash-relevant functions

The Crash Safety Module must fulfil the following crash-relevant functions:

- Evaluating the sensor signals
- Crash detection
- Determining actuators to be activated
- Specifying the trigger time and trigger sequence

# F30 Passive Safety Systems

## 4. Functions

- Activation of the ignition circuit output stages
- Sending the crash message to all bus users
- Crash documentation
- Emergency call function.

### 4.2.1. Evaluating the sensor signals

The sensors serve to identify and verify head-on, side-on and rear-end crashes and also as roll-over detection.

The sensors are directly connected to the Crash Safety Module where their signals are evaluated and processed.

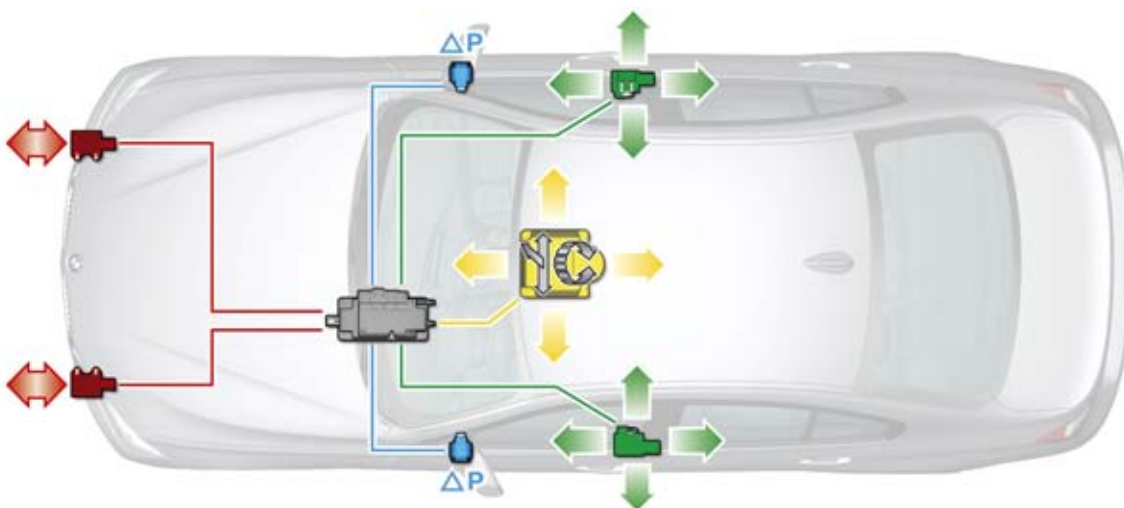
### 4.2.2. Crash detection

All F30 vehicles are equipped with the following sensors:

- One lateral and one longitudinal acceleration sensor in the B-pillars (green)
- One airbag sensor to monitor the pressure in each of the front doors (blue)
- One lateral and one longitudinal acceleration sensor in the ICM (yellow)
- One roll rate sensor in the ICM (yellow)
- One vertical acceleration sensor in the ICM (yellow)
- One front sensor on each of the engine supports (red).

The airbag sensors in the car doors assist with the identification of a side-on crash.

The front sensors on the engine supports assist with the identification of a head-on crash and the corresponding severity.



F30 Sensors

TE11-0876

# F30 Passive Safety Systems

## 4. Functions

### 4.2.3. Trigger time and trigger sequence

The Crash Safety Module uses the values transmitted by the sensors to determine the direction and severity of the crash.

In the case of a head-on crash, corresponding high acceleration values from the longitudinal acceleration sensors in the B-pillar and ICM respectively must be detected for example. An algorithm uses the accelerations to calculate the severity and direction of the crash. This information is used to assist calculation of the trigger times and sequence in which the restraint systems are activated.

A possible imminent rollover is also detected and the appropriate protection systems are energized.

### 4.2.4. Activation of the ignition circuit output stages

The Crash Safety Module is supplied by the FEM with terminal 30B. The Crash Safety Module is in of-line mode with terminal 30B. This means that it is active on the data bus and can perform all diagnostic functions. Triggering of the ignition circuits is blocked and is only enabled as of terminal 15 once the system self-test is complete. The Crash Safety Module is also ready for ignition, even with the logical terminal R after engine off.

The ignition capacitors are recharged via a switching controller. These ignition capacitors make the firing energy available in the event of a crash. If the voltage supply is interrupted during a crash, the ignition capacitors serve briefly as an energy reserve.

The ignition circuit output stages consist of a high-side and a low-side power switch. The high-side power switch connects the ignition voltage, while the low-side power switch connects to the ground. The ignition circuit output stages are controlled by a microcontroller.

The high-side and low-side power switches also serve to check the ignition circuits during the system self-test.

### 4.2.5. Sending the crash message

In the event of a collision involving activation of the restraint systems, the Crash Safety Module sends a crash message to the bus users in the bus-system network. In tandem with this, the Combox is prompted to send an emergency call via a direct single-wire connection.

As a result, the respective control units perform the following functions depending on the crash severity:

Function	Control unit
Switch off electric fuel pump	Digital Motor Electronics DME via electronic fuel pump control EKPS
Release central locking system	Front Electronic Module (FEM) All Doors Rear Electronic Module (REM) Tailgate/Trunk
Switch on hazard warning flashers	Front Electronic Module (FEM) Rear Electronic Module (REM)
Switch on interior light	Front Electronic Module (FEM) Rear Electronic Module (REM)
Send emergency call	Combox

# F30 Passive Safety Systems

## 4. Functions

### 4.2.6. Crash documentation

In the event of a collision where one or more actuators are activated, a crash entry is stored in a non-erasable memory. After three crash entries, a non-erasable fault entry is stored in the fault memory together with the information that the three crash messages have been saved. The airbag indicator light also lights up continuously.



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The three crash entries could also be stored during the course of an accident. Each crash entry is assigned a system time. The control unit remains capable of firing even after three crash entries. The crash entries cannot be erased and serve the purpose of subsequent device diagnosis. A maximum of three crash entries can be stored. The control unit must then be replaced.

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### 4.2.7. Emergency call function

The emergency call functions with the BMW Assist. This means an appropriate service provider with a call center must be available. A telephone network must also be available in order to be able to make an emergency call.

The BMW Assist optional equipment (option 6NL) must be installed for the emergency-call function to be available.

#### Manual emergency call

Drivers who are not directly involved in the accident can use the manual emergency call to request assistance.

The emergency call button is located in the roof function center and is connected to the Combox directly.

Voice contact with the relevant service provider for the country is established by pressing the emergency call button. The voice contact is indicated by a flashing LED in the switch.

#### Automatic emergency call

The Crash Safety Module sends a message to the Combox in the event of an accident with corresponding crash severity. The Combox sends an emergency call, and also the location of the vehicle if available.

Attempts are made at the same time to establish a voice contact with the occupants of the vehicle in order to obtain more detailed verbal information about the accident (e.g. condition of occupants). Further rescue operations can be initiated accordingly.

#### Advanced Automatic Crash Notification

In addition, the Advanced Automatic Crash Notification function features in vehicles with BMW Assist.

The data from different sensors is transferred to the call center in the case of an emergency call, for example the status of the belt contacts to determine the number of persons in the vehicle or sensor data on the severity of the crash to obtain the probability of risk of injury.



# F30 Passive Safety Systems

## 4. Functions

The emergency call contains additional specific information on the circumstances of the accident. This means that more precise information regarding the accident and risk of injury is therefore available at the call center and can be forwarded to the emergency coordination center. The emergency coordination center can then initiate appropriate measures.

### 4.3. System-monitoring functions

The Crash Safety Module has the following system-monitoring functions:

- System self-test (pre-drive check)
- Display of system operability
- Cyclic monitoring
- Fault display and fault storage
- Output of faults (diagnosis)
- Acoustic and visual seat belt warning
- Deactivation of the front passenger airbag and side airbag and knee airbag on the front passenger side.

#### 4.3.1. System self test

The Crash Safety Module performs a system self test from terminal 15. The airbag indicator light is energized for roughly five seconds during the system self test.

Once the system self test is complete and no faults have been identified, the airbag indicator light goes out and the system is ready to operate.

#### 4.3.2. Display of system operability

The airbag indicator light in the instrument panel goes out to indicate that the Crash Safety Module is ready for operation.

#### 4.3.3. Cyclic monitoring

Once the system self-test has been successfully concluded and the system is ready for operation, a cyclic monitoring procedure is performed for fault-monitoring purposes. This cyclical monitoring serves the internal diagnosis of the control unit and overall airbag system. Cyclical monitoring takes place continuously from terminal 15. This also continues when logical terminal R is reached after the engine is switched off.

#### 4.3.4. Fault display and fault storage

The Crash Safety Module has a non-volatile fault memory. The airbag indicator light lights up to indicate a fault entry.

Events, such as the activation of an airbag or seat belt buckle tensioner, are also stored in the fault memory.

# F30 Passive Safety Systems

## 4. Functions



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If the fault memory contains the entry that the restraint system has been activated, this only means the ignited restraint system is not available for further activation and not that it malfunctioned during the crash.

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### 4.3.5. Output of faults (diagnosis)

The fault memory can be read out via the diagnostic interface with the assistance of the Integrated Service Technical Application ISTA in the BMW diagnosis system. After rectifying the faults or after re-nesting activated components, the fault memory can be cleared with the diagnosis command "Clear fault memory".

### 4.3.6. Acoustic and visual seat belt warning

An acoustic and visual seat belt warning is a standard feature of all vehicles equipped with the Crash Safety Module. The Crash Safety Module records whether or not the driver or front passenger have fastened their seat belts. If they have not, an acoustic and visual warning is output to remind them to fasten their seatbelts. Both seat belt buckle switches are monitored separately.

### 4.3.7. CIS Mat

Provision is made in the F30 for the airbag to be deactivated automatically in order to satisfy the regulations of the National Highway Traffic Safety Administration NHTSA. When the child seats listed in the regulation are occupied by a child this must lead to deactivation of the airbag.

To do so, a seat occupancy mat is used on the front passenger seat for the purpose of occupancy detection and classification of occupants in the front passenger seat. A further development of the Occupant Classification 3 mat (OC3 mat), the Capacitive Interior Sensing Mat (CIS mat) is used in the F30.

The CIS mat is made up of two elements: A sensor wire, which runs parallel to the seat heating in the seat cushion and an evaluation unit. The CIS mat measures the capacity and ohmic resistance between the sensor wire (anode) and the vehicle ground (cathode) at a frequency of 120 kHz. The CIS mat determines from the change in capacity and resistance whether the front passenger seat is occupied by an adult or a child in a child seat.

The deactivation of the front passenger airbag, the side airbag and knee airbag on the front passenger side is signalled by the indicator lamp for front passenger airbag deactivation.

The indicator lamp for front passenger airbag deactivation in the roof function center lights up if a child seat with child for e.g. a child restraint system that has been tested in accordance with the NHTSA regulations and is holding a small child is detected on the front passenger seat or if the front passenger seat is unoccupied.

The display brightness is controlled by automatic regulation of the display illumination.

# F30 Passive Safety Systems

## 5. System Components

### 5.1. Crash Safety Module

The Crash Safety Module is accommodated in a housing with two sockets.

The wiring harness is connected via one of the sockets. An additional socket is provided for the cockpit wiring harness.



F30 Crash Safety Module

The Crash Safety Module is located in the F30 on the supporting structure of the cockpit module on the driver's side.

The Crash Safety Module no longer contains any sensors. The sensors are located in the ICM on the transmission tunnel.

### 5.2. Sensors and switches

The following sensors and switches are installed:

- Lateral and longitudinal acceleration sensors in ICM
- Roll rate sensor in the ICM
- Vertical acceleration sensor in the ICM
- Lateral and longitudinal acceleration sensors on the B-pillars
- One airbag sensor for pressure in each of the front doors (blue)
- One front sensor on each of the engine supports
- CIS mat with occupant classification

# F30 Passive Safety Systems

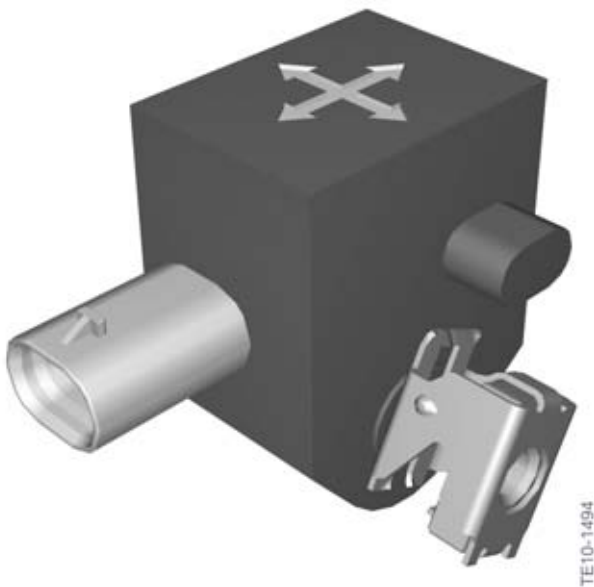
## 5. System Components

- Seat belt buckle switch
- Seat-position sensor, front passenger
- Emergency call button

### 5.2.1. Lateral and longitudinal acceleration sensor, B-pillar

The lateral and longitudinal acceleration sensors in the B-pillars assist with the identification of head-on crashes, side-on crashes and rear-end crashes.

The B-pillar airbag sensor consists of a longitudinal acceleration sensor and a lateral acceleration sensor. The acceleration sensors measure both the acceleration and the deceleration in the X and Y directions. The resultant from the X and Y signals is decisive in identifying the direction of the crash. The airbag sensors in the B-pillar assist with the identification of head-on, side-on and rear-end crashes. The B-pillar airbag sensors on the left and right are of identical design and are allocated by way of mechanical coding during installation.



F30 Lateral and longitudinal acceleration sensor, B-pillar

### 5.2.2. Door airbag sensor (pressure)

Pressure sensors are installed in the driver and front passenger doors. Side crashes are identified with the assistance of the airbag sensors. In addition to the lateral acceleration values that are present, the pressure in the door cavity also increases in the event of a side-on crash.

The airbag sensors in the doors serve to verify the plausibility of the acceleration signals from the B-pillar airbag sensors and the ICM when a side crash is detected. The airbag sensors are situated in the inner panel of the doors and measure the increase in pressure in the event of a side collision. In the event of a side collision with the door, the outer panel is pressed inward, thus reducing the volume and increasing the pressure in the door interior. This pressure change is measured by the airbag sensors. The airbag sensor also includes electronics, in addition to the pressure sensor, that digitize the

# F30 Passive Safety Systems

## 5. System Components

pressure readings and transmit them cyclically to the Crash Safety Module. The data is transferred in the same way as the B-pillar airbag sensors. The pressure readings are evaluated in the Crash Safety Module.



F12/F13 door airbag sensor (pressure)

### 5.2.3. Front sensor

Two front sensors are installed in the front area of the engine support. The measured values are forwarded to the Crash Safety Module where they are evaluated.

The sensors in the front area of the side member on the left and right assist with identification of a head-on crash.

They deliver additional information to the crash safety module on the characteristics and severity of the collision. Each sensor contains an acceleration sensor for recording the deceleration, signal processing technology and an ASIC for data transfer. The measured values are sent in the form of a data telegram to the crash safety module and are used in the calculation of the algorithm.



F30 Up-front sensor engine support

# F30 Passive Safety Systems

## 5. System Components

### 5.2.4. Sensors in the ICM

The ICM control unit is located centrally on the transmission tunnel. In addition to the driving dynamics control sensors, the ICM in the F30 also incorporates longitudinal and lateral acceleration sensors for crash detection.

In order for the ICM to be able to transmit the sensor data directly to the ACSM 4, it is connected to the latter via two lines. The transmitted data is evaluated in the ACSM 4.

The sensor data of the roll rate sensor and the vertical acceleration sensor is transmitted to the ACSM via the two additional lines.

The sensor data of the ICM helps the ACSM 4 identify side-on, rear-end or head-on crashes and assists with roll-over detection.



F30 ICM

Index	Explanation
1	ICM control unit

### 5.2.5. CIS mat

The capacitive interior sensing mat (CIS mat) is fitted in the front passenger seat instead of the seat occupancy mat. The CIS mat can detect whether the front passenger seat is occupied by an adult or a child in a child seat. The deactivation of the front passenger airbag and side airbag and knee airbag on the front passenger side is signalled by the indicator lamp for front passenger airbag deactivation.

# F30 Passive Safety Systems

## 5. System Components

### 5.2.6. Seat belt buckle switch

The seat belt buckle switch detects whether the seat belt buckle tongue is in the seat belt buckle. The Crash Safety Module supplies power to the sensors and performs the evaluation.

From terminal 15, the seat belt buckle switch is permanently monitored and used for the visual and acoustic seat belt warning and also to determine which restraint systems are triggered.



TE08-1294

F30 Seat belt buckle switch

### 5.2.7. Emergency call button

The emergency call button is located in the roof function center.



TE11-0071

F30 Roof function center with emergency call button

### 5.2.8. Seat-position sensors

In accordance with the US legal requirement (FMVSS208), a height identification for the person in the driver and front passenger seat must be effected. This height identification is effected via the adjustment travel of the forward/back seat adjustment. In US-version vehicles, the exact position is identified

# F30 Passive Safety Systems

## 5. System Components

using the seat-position sensors for the driver and front passenger seats. For vehicles with an electric seat adjustment with memory (option 459), the seat position on the driver's side is transferred from the seat module on the driver's side to the ACSM.

The job of the seat-position detector is to distinguish between a relatively small person and a person of normal height within the lengthways adjustment range of the seat. This detection is another technical feature aimed at increasing the safety of the occupants. The deployment of the two airbag stages and the adaptive vent valve is then adjusted to the driver's/front passenger seat position.

The seat-position detector takes the form of a 2-wire Hall-effect sensor and is supplied with power via the ACSM control unit. The current level of the seat-position sensor changes depending on the seat position or the distance of the seat-position sensor to the permanent magnet.

### 5.3. Actuators

#### 5.3.1. Overview

The following actuators are installed in the F30:

- Two-stage driver's airbag with active vent valve
- Two-stage driver's airbag with active vent valve
- Knee airbag on front left and right
- Head airbag on left and right
- Side airbag on front left and right
- Seat belt buckle tensioner on front left and right
- Automatic tensioner with linear force limiter
- Automatic tensioner with adaptive force limiter
- Safety battery terminal.

In addition, the following indicator lights inform the vehicle occupants about the condition of the safety systems:

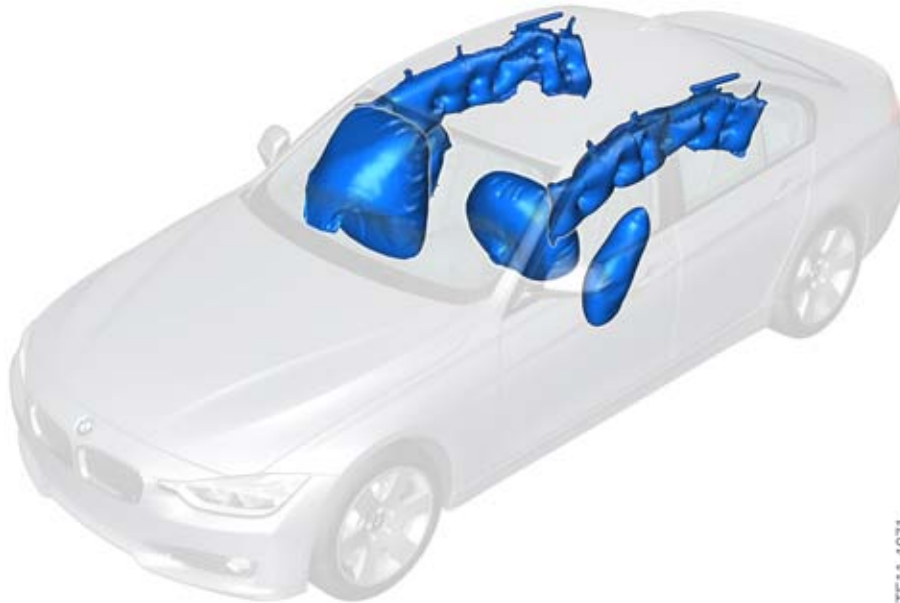
- Airbag indicator light
- Seat belt warning light
- Indicator lamp for front passenger airbag deactivation.



# F30 Passive Safety Systems

## 5. System Components

The following graphic shows the airbags in the activated state. Depending on the type of crash, only specific airbags are activated.



TE11-1071

F30 Airbags

The familiar three-point seat belts are used as the seat belt systems in the F30.



TE11-0890

F30 Seat belt

# F30 Passive Safety Systems

## 5. System Components

Index	Explanation
1	Seat belt buckle tensioner
2	Reversible motor-driven reel ReMA (not US)
3	Automatic reel/Automatic tensioner

The following table provides an overview of the actuators of the seat belt systems:

	Seat belt tensioner	Automatic reel	Force limiter	Reversible motor-driven reel
F30 Vehicles	Yes	Yes	Linear	No

### 5.3.2. Driver's airbag

The purpose of the driver's airbag is to reduce the risk of injury to the driver in combination with the seat belt when a head-on crash occurs. The driver's airbag is located in the steering wheel impact plate. The driver's airbag is equipped with a gas generator.

A two-stage generator is installed which can be used to activate the stages at short or long time differences, depending on the severity of the crash detected and taking into consideration the seat position.

Furthermore, the driver's airbag features an active vent valve.

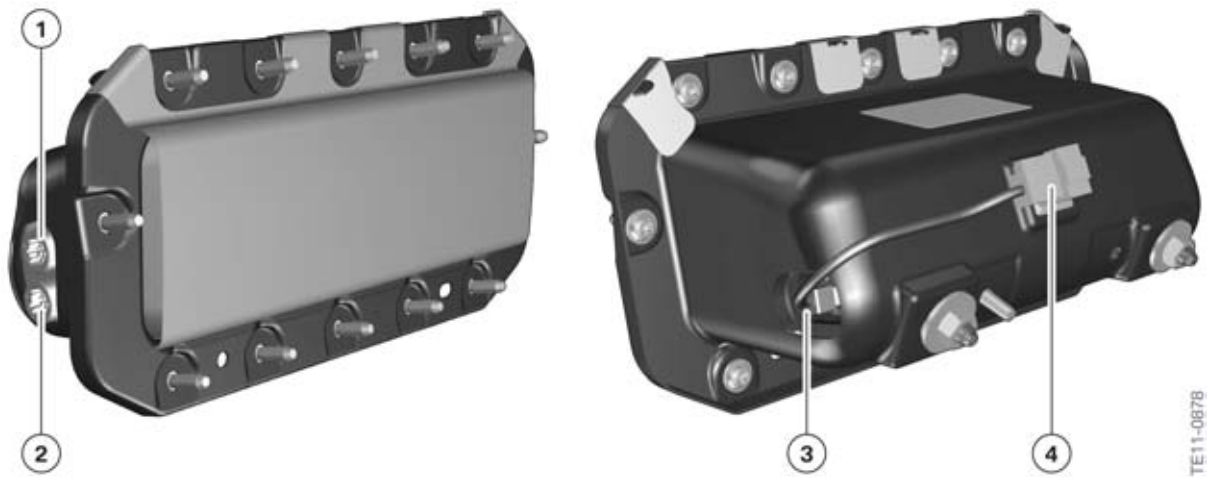
### 5.3.3. Front passenger airbag

The purpose of the front passenger airbag is to reduce the risk of accident to the front passenger in the event of a head-on crash. The front passenger airbag is located in the dashboard. When the front passenger airbag expands, the dashboard tears open at defined points. The front passenger airbag opens towards the windscreen, emerges in the upwards direction and is supported on the windscreen and dashboard. The front passenger airbag is equipped with a gas generator.

A two-stage generator is installed which can be used to activate the stages at short or long time differences, depending on the severity of the crash detected and taking into consideration the seat position.

# F30 Passive Safety Systems

## 5. System Components



F30 Front passenger airbag

Index	Explanation
1	Ignition squib
2	Ignition squib
3	Vent valve
4	Vent valve connection

Furthermore, the front passenger airbag features an active vent valve.

### 5.3.4. Knee airbag

The driver's side knee airbag and front passenger side control the forwards displacement of the occupant(s) in the event of a head-on crash.



F30 Knee airbags

Index	Explanation
1	Knee airbag, driver's side
2	Knee airbag, front passenger side

### 5.3.5. Head airbag

Head airbags are installed in the F30 to protect the occupants' heads in the event of a side collision.

# F30 Passive Safety Systems

## 5. System Components

The head airbag extends from the A-pillar to the C-pillar and covers the entire area of the side windows. It expands between the occupants and side structure.

System features:

- Extended covered area across all front and rear side windows
- Protection of occupants from glass splinters
- Covered area for different-sized occupants optimized.



F30 Head airbag

### 5.3.6. Side airbag, front

As with all current models, the side airbag at the front ignites out of the front seat backrest.

The side airbags and gas generators are accommodated in a plastic housing, the airbag module. This is installed in the front seat backrest and is concealed by the seat cover.

If activated, the side airbag emerges outwards from the backrest frame and spreads between the side structure and occupant.



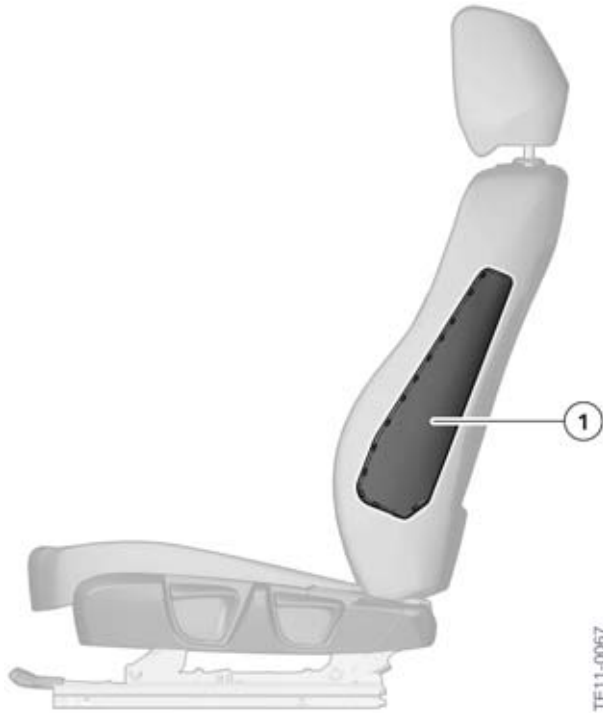
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It is important to ensure that no additional seat covers are fitted as they would greatly impair the function of the side airbag, or even immobilize it altogether.

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# F30 Passive Safety Systems

## 5. System Components



F30 Seat with side airbag

Index	Explanation
1	Side airbag

### 5.3.7. Seat belt buckle tensioner

The task of the pyrotechnic seat belt buckle tensioner is to minimize the belt slack in the pelvis and shoulder regions in the event of a crash, thereby improving the restraining effect.

The seat belt buckle tensioners are located at the driver's seat or the front passenger seat. The seat belt buckle tensioners are ignited in specific crash situations.

The seat belt buckle is connected by means of a steel cable to the piston in the tensioning tube. If the ignition squib is triggered, gas pressure is created, which moves the piston in the tensioning tube. This causes the cable to pull the seat belt buckle down and the seat belt is tensioned.

# F30 Passive Safety Systems

## 5. System Components



F30 Seat belt buckle tensioner

Index	Explanation
1	Seat belt buckle switch
2	Tensioning tube with piston

### 5.3.8. Automatic tensioner with linear mechanical force limiter

An automatic tensioner with linear mechanical force limiter for the driver and front passenger is used in the F30. In addition to force limitation effected by a torsion bar spring, the seat belt strap is retracted with the assistance of a gas generator in order to reduce belt slack prior to forwards displacement of the occupant.

By harmonizing the individual passive safety components, seat belt tensioner, automatic tensioner, force limiter and airbag, the kinetic energy acting on the occupants is dissipated more evenly for the duration of the crash. Thus lower occupant stress values are achieved.

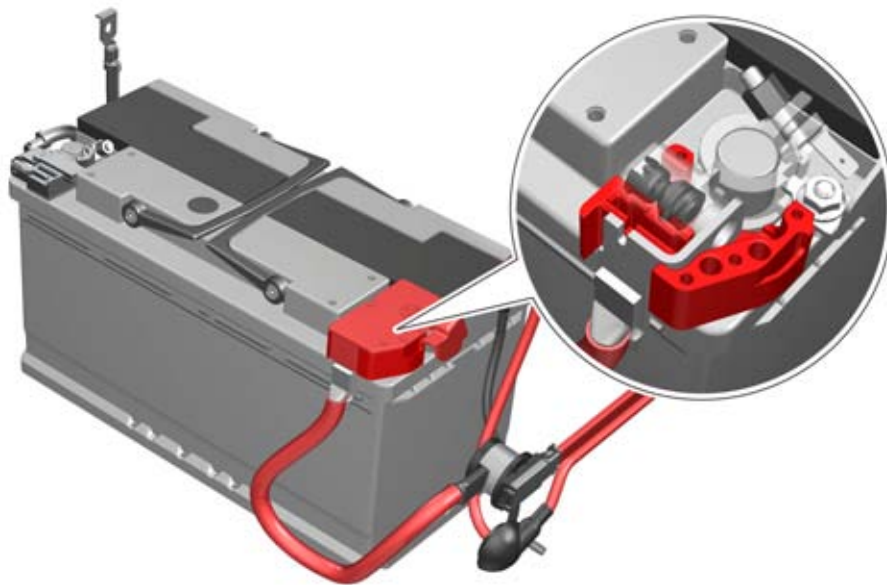
### 5.3.9. Safety battery terminal

The safety battery terminal is triggered at different thresholds when the Crash Safety Module detects a head-on, side-on or rear-end crash of sufficient severity. The line that connects the battery to the starter motor/alternator and positive battery connection point is then severed by means of pyrotechnics. The safety battery terminal is located directly at the positive terminal of the battery. The safety battery terminal is encased completely in plastic so that in the event of separation no sparks get outside the case.

Even though the safety battery terminal has been disconnected, a voltage supply to all safety-relevant consumers such as hazard warning flashers, interior light, airbag and telephone (including emergency call) is ensured.

# F30 Passive Safety Systems

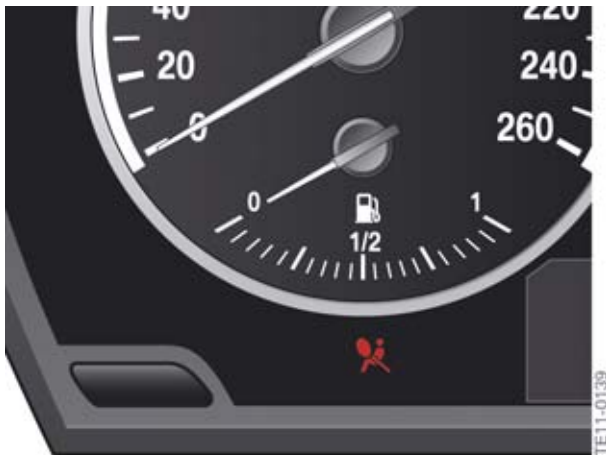
## 5. System Components



F30 Safety battery terminal

### 5.3.10. Airbag indicator light

The airbag indicator light is located on the instrument panel. The airbag indicator light lights up then goes out during the pre-drive check to signal readiness of the Crash Safety Module and passive safety systems. The airbag indicator light is controlled via a message on the PT-CAN from the Crash Safety Module to the instrument panel. The instrument panel receives a message cyclically. If the message remains off, the airbag indicator light is activated.



F30 Airbag indicator light

# F30 Passive Safety Systems

## 5. System Components

### 5.3.11. Seat belt warning light

A visual and audible warning is issued if the seat belt is not fastened or is unbuckled during the journey.



F30 Seat belt warning light

The status of the seat belt contacts of the rear seat bench is visible for a short period in the instrument cluster TFT display during starting or if a contact is changed.

### 5.3.12. Indicator lamp for front passenger airbag deactivation

The indicator lamp for front passenger airbag deactivation in the F30 is in the roof function center. The indicator lamp for front passenger airbag deactivation is activated if the CIS mat detects a small child in a child seat or if the front passenger seat is unoccupied.

The brightness of the indicator lamp for front passenger airbag deactivation is controlled via the automatic brightness control of the display illumination.



F30 Roof function center with indicator lamp for front passenger airbag deactivation







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